CLAIMS

1. A control device (1) for a rotating electrical machine, configured to be connected to a ground and to be reversible to operate as an electric generator in an alternator mode and as an electric motor in motor mode in order to start a thermal motor, including a command and control unit (3) to control the rotating electrical machine in alternator mode or in motor mode, an electric power network (5), a main battery (4) connected to the electric power network (5) and to the ground of the rotating electrical machine (2), the rotating electrical machine comprising:

a plurality of phases each having at least one winding (E1, E2, E3);

a stator (S) equipped with phase windings;

an inverter (P, 20) which powers the phase windings of the stator for operation in motor mode;

a rectifier bridge for current generated by the phase windings of the stator for operation in alternator mode;

characterized in that the inverter (p, 20) is powered in motor mode by a start-up control unit (9) which has a secondary voltage source (6) that can provide a voltage greater than the voltage present on the electric power network (5) to increase the machine torque at the start-up of the electric motor, in that the inverter is connected to the positive terminal of the secondary voltage source (6) via a first switch (K1) in motor mode, and in that the rectifier bridge (P) is connected to the positive terminal of the main battery (4) via a second switch (K2) in alternator mode.

2. The control device (1) according to claim 1, characterized in that the start-up control unit (9) has a secondary voltage source (6) connected in series with the main battery (4).
3. The control device (1) according to claim 1, characterized in that the start-up control unit (9) has a secondary voltage source (6) connected in parallel with the main battery (4).
4. The control device (1) according to claim 1, characterized in that the secondary voltage source (6) is a battery.
5. The control device (1) according to claim 1, characterized in that the secondary voltage source (6) is of ultra-capacity.
6. The control device (1) according to claim 1, characterized in that the first and second switches (K1, K2) are MOSFET type transistors.
7. The control device (1) according to claim 6, characterized in that the MOSFET switches (K1, K2) each comprise two MOSFET transistors mounted head to tail in series (K11, K12, K21, K22).
8. The control device (1) according to claim 6, characterized in that the two switches (K1, K2) are activated in opposing phases.

9. The control device (1) according to claim 2, characterized in that the two switches (K1, K2) are controlled by a switching and control unit (8), which is slaved to the command and control unit (3) of the rotating electrical machine.

10. The control device (1) according to claim 2, characterized in that the charge level of the secondary voltage source (6) is controlled and managed by a management unit (7).

11. The control device (1) according to claim 2, characterized in that the voltage of the secondary voltage source (6) can vary between 3 volts and 12 volts.

12. The control device (1) according to claim 1, characterized in that the inverter is mechanical.

13. The control device (1) according to claim 1, characterized in that the inverter is a rectifier bridge (P) that has controlled switches (T).

14. The control device (1) according to claim 3, characterized in that it comprises:

a main circuit (59) that includes the main battery (4) connected to the electric power network (5), and the second switch (K2) connecting the main battery (4) to the rectifier bridge (P);

a bypass circuit (60) connected in parallel to the terminals of the main circuit (59) and including the secondary voltage source (6) in series with the first switch (K1);

a reversible DC/DC converter (62) electrically connected between the main circuit (59) and the bypass circuit (60) between the positive pole of the main battery (4) and a middle point of the first switch (K1) and the secondary voltage source (6).

15. The control device (1) according to claim 14, characterized in that a supervising circuit (63) controls and powers the switching status of the switches (K1, K2), the charge status of the main battery (4) and of the secondary voltage source (6), the direction of conversion of the DC/DC converter (62), and the operating mode of the rectifier bridge (P) in alternator or motor mode.

16. The control device (1) according to claim 14, characterized in that the first switch (K1) is crossed by the maximum permanent current of the rotating electrical machine (2) in alternator mode, while the second switch (K2) is used for the transient phases when the output voltage of the rotating electrical machine (2) is greater than a pre-defined voltage threshold.

17. The control device (1) according to claim 15, characterized in that the supervising circuit (63) reverses the switching status of the switches (K1, K2) when the output voltage of the electrical machine is regulated above the voltage threshold, with the first switch (K1) open and the second switch (K2) closed, in order to supply current to the electric supply network (5) by the DC/DC converter (62).

18. The control device (1) according to claim 17, characterized in that the energy of the rotating electrical machine (2) operating in alternator mode permits, when the second switch (K2) is closed, to supply the DC/DC converter (62) and to charge the secondary voltage source (6) while storing energy.

19. The control device (1) according to claim 14, characterized in that high power receptors (64) are connected electrically in parallel with the bypass circuit (60) and the alternator-starter (2).

20. The control device (1) according to claim 1, characterized in that the rotating electrical machine is an alternator-starter for an automobile.